Report on the first meeting of ISPRS Working Group V/6 on Medical image analysis, human motion and body measurement

www.commission5.isprs.org/wg6

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Introduction

The first meeting of the newly formed working group V/6 of ISRPS was held in Zurich on Monday 21st of February 2005, from 10 am to 6 pm. It was hosted by Prof. Dr. Gábor Székely of the Computer Vision Laboratory of the Swiss Federal Institute of Technology (ETH). Participants at the meeting were five of the seven members of the board:

- Prof. Dr. Petros Patias (chair) of the Aristotle University of Thessaloniki, Greece,
- Dr. Nicola D'Apuzzo (secretary) of Homometrica Consulting, Zurich, Switzerland,
- Prof. Dr. Gábor Székely of ETH Zurich, Switzerland,
- Prof. Dr. Hans-Peter Meinzer of the German Cancer Research Center, Heidelberg, Germany
- Prof. Dr. Petros Koidis of the Aristotle University of Thessaloniki, Greece.

Board members excused from the meeting were:

- Prof. Dr. Serge Van Sint Jan of the University of Brussels, Belgium and
- Dr. Harvey Mitchell of the University of Newcastle, Callaghan, Australia.

Guests of the meeting were Dr. Emmanuel Baltsavias of ETH Zurich as second vice president of ISPRS and Fabio Remondino, also of ETH Zurich, as responsible of the liaison between ISPRS and ISB (International Society of Biomechanics).

From left to right: Fabio Remondino, Petros Koidis, Petros Patias, Gábor Székely, Nicola D'Apuzzo, Hans-Peter Meinzer, Emmanuel Baltsavias.

Topics

The topics discussed during the meeting were the followings:

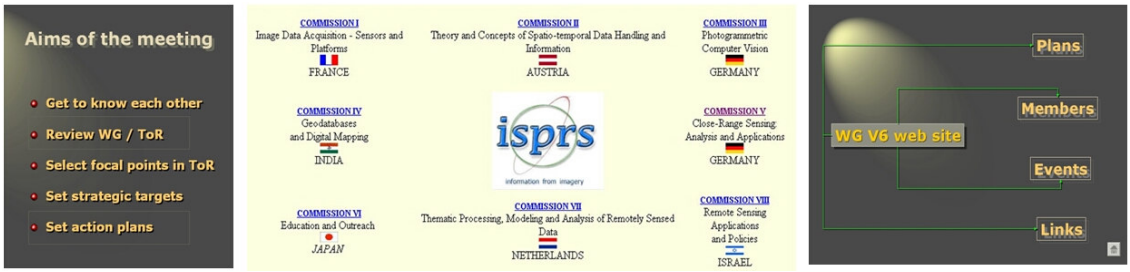
1. Introduction of the working group, aims of the meeting
2. Presentations of board members
3. Goals for the next four years
   3a. Goals of the working group
   3b. Joint projects
   3c. Organization of workshop
   3d. Participation at conferences
   3e. Definition of datasets
4. Next tasks

1. Introduction of the working group, aims of the meeting

At the beginning of the meeting, Petros Patias introduced the goals of the working group and explained the basic structures of ISPRS to the members not familiar with them.
He listed the aims of the first meeting of the working group in five important points:

- get to know each other,
- review the working group terms of reference,
- select focal points,
- set strategic targets and
- set actions plans.

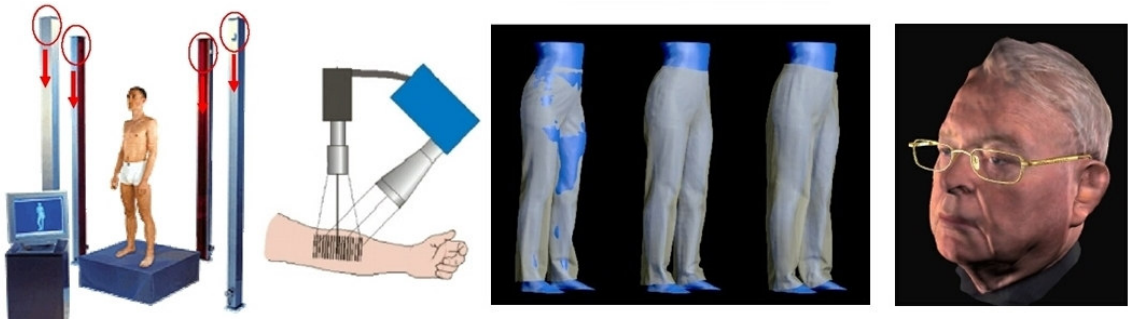
He then introduced the ISPRS (International Society of Photogrammetry and Remote Sensing). It is organized in eight commissions, every commissions is divided into working groups. Our working group is part of the commission V which is dealing with close range photogrammetry, i.e. from micro to macro (100m) object distances. Additional information about ISPRS can be found at the web page www.isprs.org.
Petros Patias, chair of the Working Group V/6 and former chair of the Commission V, found very attractive and challenging the topic "medical image analysis". He has done some work about medical image analysis during his career, however his great contribution to the working group is his deep knowledge of the structures and organization of ISPRS. He stated that the current structure of our working group is very uncommon to ISPRS and that the goals of the next four years are to make it for the first time a very active and producing working group, capable of organizing workshops, tutorials, conferences, as well as to connect people from different communities and to perform together important works and projects.



Snapshots of Petros Patias's introduction: aims of the meeting (left), ISPRS commissions (center), functions of the WG V/6 web site.

2. Presentations of board members

After the introduction of Petros Patias, all the board members present at the meeting shortly introduced themselves. In this way, everybody could know each others better and an overview of the different expertises and activities of the board members could be determined. Some information and images extracted from the individual presentation are listed in this report.
Nicola D'Apuzzo has a background of mechanical engineering with focus on biomedical applications, moreover he received his Ph.D. in the topic of human body measurement and tracking from video images. Currently he directs in Zurich a consulting firm in the field of human body measurements (www.homometrica.ch). His main activities regard 3D human body scanning for various applications in medicine and fashion/beauty.

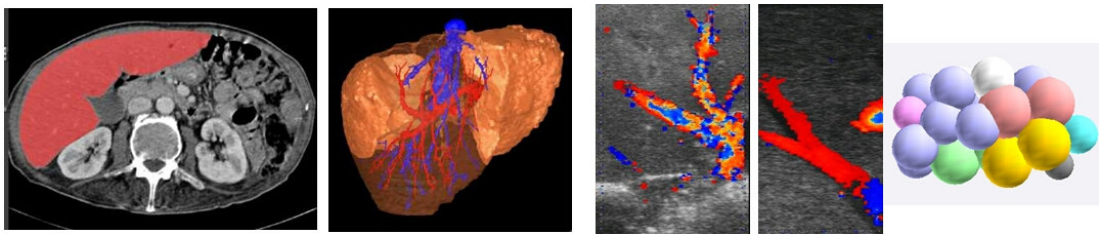


Some of the consulting activities of Nicola D'Apuzzo (from left to right): full body laser scanner, skin measurement system, "best fit" application of full body 3D scanning in the fashion industry, "virtual-make-over" application as virtual glasses on a 3D scanned head.

Gábor Székely currently directs the Medical Image Analysis and Visualization group of the Computer Vision Laboratory of ETH Zurich. The main research topics of the group are: computer aided surgical navigation, segmentation of medical images, visualization of medical data, image registration from different sources (e.g. CT, NMR, PET, surface), quantitative X-ray analysis and surgical simulation.

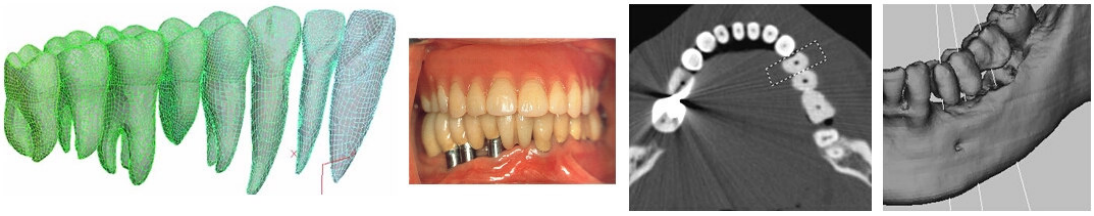
Some actual works of the medical imaging group directed by Gábor Székely (from left to right): automatic segmentation of patellar cartilage from NMR, 3D visualization of medical data (colon), surgical scene simulation (bleeding in hysteroscopy), generation of virtual anatomical model.

Hans-Peter Meinzer is director of the division Medical and Biological Informatics of the German Cancer Research Center in Heidelberg. He explained his rich background on bioinformatics and medical imaging. The current main research activities of his group are: segmentation of medical images (CT, NRM, echography) for diagnosis and therapy support, augmented reality and navigation in computer aided surgical intervention, 3D echography, and 3D simulation of cell migrations. The current main applications are cardiology, heart surgery and liver surgical planning.



Some actual works of the Medical and Biological Informatics group directed by Hans-Peter Meinzer (from left to right): segmentation of liver in CT images, 3D reconstruction of liver and vessel systems, blood flows in echographic images of liver, 3D simulation of cell migrations.

Petros Koidis is the only health personnel of the board. He is professor at the Department of Fixed Prosthesis and Implants Prosthodontics of the Dental School of the Aristotle University of Thessaloniki in Greece. His current activities imply mouth rehabilitation and biomaterials for medical and dental applications. The main topics of his actual research are focused on: dental and implant treatment planning and therapeutics, modification of existing materials, development of new materials corresponding to biological structures, biomimetics and tissue engineering.

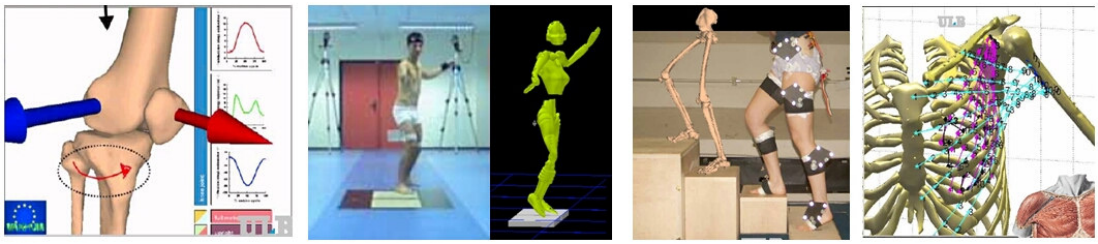


Some areas of the research performed by Petros Koidis.

Fabio Remondino was present at the meeting as responsible of liaisons between ISPRS and ISB (International Society of Biomechanics). He is also co-chair of the ISPRS Working Group V/4 on Virtual Reality and Computer Animation. He is currently at the final stage of his Ph.D. at the Institute of Geodesy and Photogrammetry of ETH Zurich. His expertise is mainly focused on human body and human motion reconstruction from video sequences.

Some of the activities of Fabio Remondino (from left to right): human body reconstruction from uncalibrated still images, a frame of a video sequence, reconstructed movements, animated view.

Serge Van Sint Jan could unfortunately not attend the meeting because of an illness. However, he submitted a presentation describing his activities. He is professor at the Department of Anatomy of the University of Brussels in Belgium. The research activities regard functional anatomy and biomechanics.



Some of the works where Serge Van Sint Jan is involved (from left to right):
kinematic analysis of knee joint, motion capture for animation and video games,
virtual simulation of movements for ergonomy, biomechanical modeling of musculo-skeletal system.

3. Goals for the next four years

After a lunch break the meeting continued and the discussion about the activities of the working group started. Five different topics were considered:

(a) the goals of the working group,
(b) possible joint projects,
(c) the organization of a workshop,
(d) the participation at conferences,
(e) the definition of datasets

3a. Goals of the working group

The term of reference as listed in the home page were taken as basis for the discussion about the general goals of the working group:

- Research and development in techniques and systems for analysis and 3D reconstruction in medical imaging, dentistry, and biomaterial engineering, biomedical and biomechanical engineering, tele-medicine, advanced 3D computer vision techniques and medical VR/AR.
- Research and development in techniques and systems for analysis, 3D reconstruction and applications in sport medicine and fitness (e.g. motion capture, human gait analysis, full body measurement, shape tracking) and face and expression analysis.
- Vision techniques in biometry research, security applications and forensics.
- Applications of 3D surface measurement techniques for medical applications (orthodontics, prosthetics, orthopedics, plastic surgery, reconstructive medicine, forensic medicine, dentistry, ORL, cosmetics).
- Applications of 3D motion capture techniques for clinical motion analysis, registration of patient-specific data.
- Adaptation of photogrammetric techniques for geometric modelling and (self-)calibration of X-ray and tomography systems.
- Cooperation and collaboration between ISPRS and the communities of medical/biomedical engineering, human/user interface development and animation.

About the terms of reference, it was suggested to restrict them and focus only on certain areas, especially where photogrammetry has his strength, as application of 3D surface measurements for medical applications. Finally, following Meinzer's suggestion, the goals are kept open as much as possible to allow more researchers to integrate into the working group and to make it interesting to larger communities.

3b. Joint projects

The second topic discussed was about the possibility to submit a proposal for a joint project for the EU 6th Framework Program. Biomedical related topics were present in the IST program. However, the deadline for proposal submission was fixed on March 22 2005 and therefore little time would be available for the definition of a project. Finally, we decided that it would be too late to propose a joint project for this EC funding call. Other calls of the 6th FP with deadline on September 2005 were analyzed in detail, however no topics were present where a projects of our working group could be proposed.
Finally it was decided to wait for the calls of the 7th Framework Program. This should appear soon, probably April 2005 and the deadlines for proposal submissions should be for March 2006. For the 7th FP, our working group should have enough time to organize ideas for one or more joint projects.

3c. Organization of workshop

The next topic of the discussion was about the organization of a workshop in November 2005. Székely proposed to focus the workshop on 4D (4 dimensions) or 3D+T (3 dimensions + time). Everybody agreed that the topic would be very interesting and attractive. In fact, it includes several research and application areas. A few examples are: movement analysis and joint kinematics, navigation in computer aided surgical interventions, dynamic 3D surface measurement, long time shape tracking (e.g. organ growth, fitness, anthropology). It was decided to enlarge the topic from "human" to "living organism" which include also biology with topics as for example cell transportation systems.
The workshop should be focused, but not closed, to European countries. It was proposed to invite lecturers and also to invite clinicians to the workshop (Meinzer knows some craniofacial and heart surgeons that would participate). In this way, the workshop could represent a first attend to establish a platform to connect photogrammetry, medical imaging and medicine.
It should be attended by about fifty participants and it should be not longer than a week.
Patias proposed Agios Nikolaos, a picturesque small town in Crete, Greece as place where the workshop should be held. Koidis also agreed that it is a good place and they both have connections there, the organization would in this case be easier. The period of November 2005 was also judged appropriate.
It was proposed that at the beginning of the workshop, all participants should make a brief presentation of themselves and their activities (as it happened at the working group meeting). This should allow for a better communication between the participants that would have very different expertise. Tutorials about medical imaging issues could also be offered at the workshop.

3d. Participation at conferences

The complete list of conferences related to medical imaging was analyzed and the following conferences were listed as probable candidates for an active participation of our working group, by organizing technical sessions and/or tutorials:

- SPIE Medical Imaging,
  San Diego, USA, February 2006
  Activity: technical session
- MICCAI (Medical Image Computing and Computer Assisted Intervention),
  Palm Springs, USA, October 2005
  Activity: Organization of tutorial
- CARS (Computer Assisted Radiology and Surgery),
  Berlin, Germany, June 2005
  Activity: too late for this year, but ok for 2006
- CAOS (Computer Assisted Orthopaedic Surgery),
  Helsinki, Finnland, June 2005
  Activity: too late for this year, but ok for 2006
- 9th Symposium on 3D Analysis of Human Movement,
  Valencienes, France, July 2006
  Activity: technical session in photogrammetry

- ISPRS Comm. V Symposium,
  Dresden, Germany, September 2006
  Activity: technical sessions.

Responsible persons should be designed for every conference where the working group will be active.

3e. Definition of datasets

The last topic of the goals of the working group was about the publication of problems and datasets. One or more problems for medical imaging that could be solved by photogrammetrists should be identified and clearly presented at the web page of the working group. The description should include: (a) the definition of the problem to solve, (b) the dataset (e.g. images) and (c) what is expected as result.

4. Next tasks

The last theme of discussion was about the short term tasks. Four were identified:

- the publication of a report on ISPRS Highlights about the WG V/6 meeting,
- the publication on the WG web page of an invitation letter,
- the board members should forward the link of the WG web page to possible new WG members,
- an action table should be prepared with issues, deadlines, responsible and actions.

Final words

All the participants of the working group meeting were satisfied with the results achieved. Everybody knows the other board members better and the aims of the working group are now stated more clearly. The meeting was closed with a glass of wine.
All readers of this report, working in the fields of the working group, are invited to join and become active members. Please visit our homepage at the following web address: www.homometrica.ch/isprs.